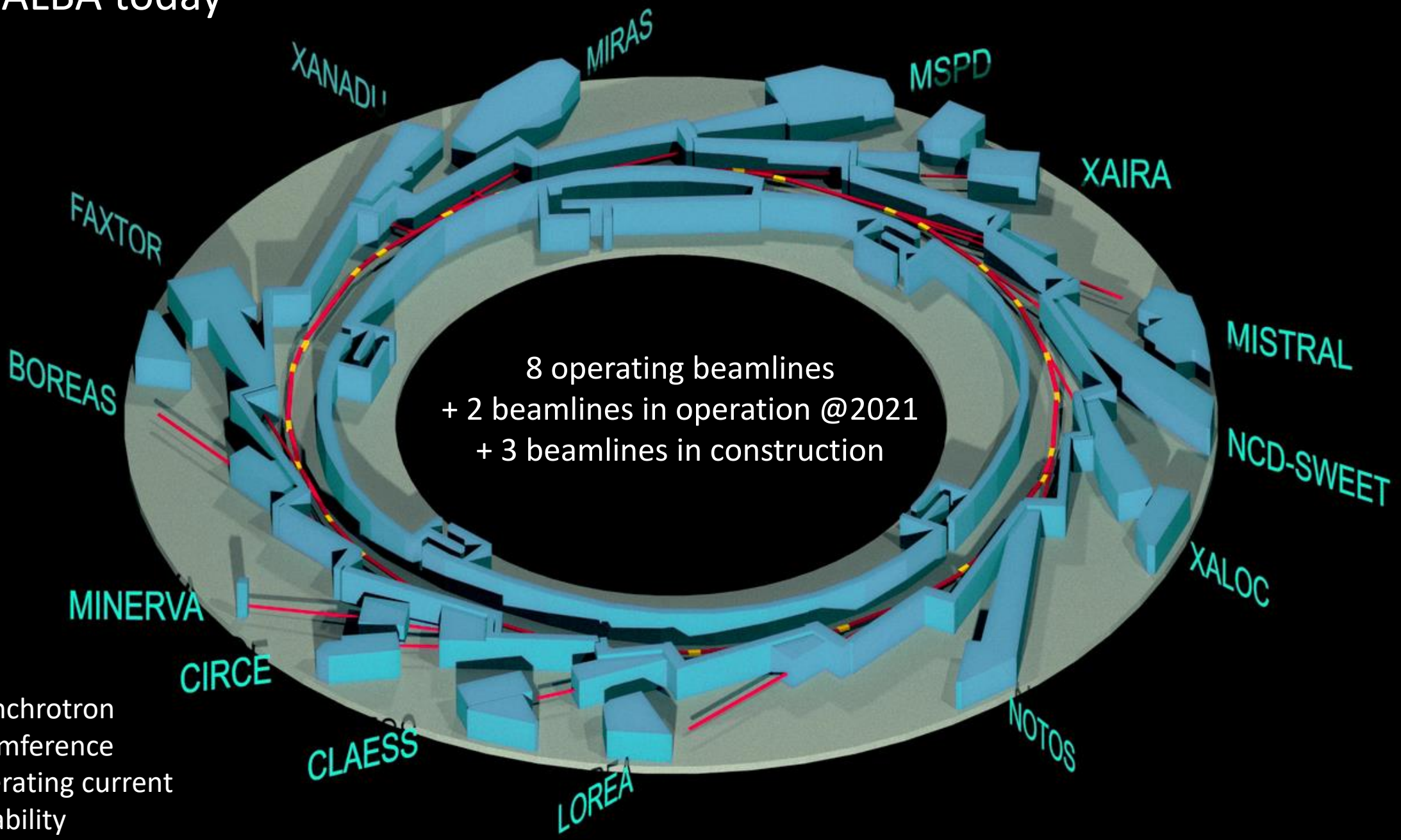
ALBA Synchrotron

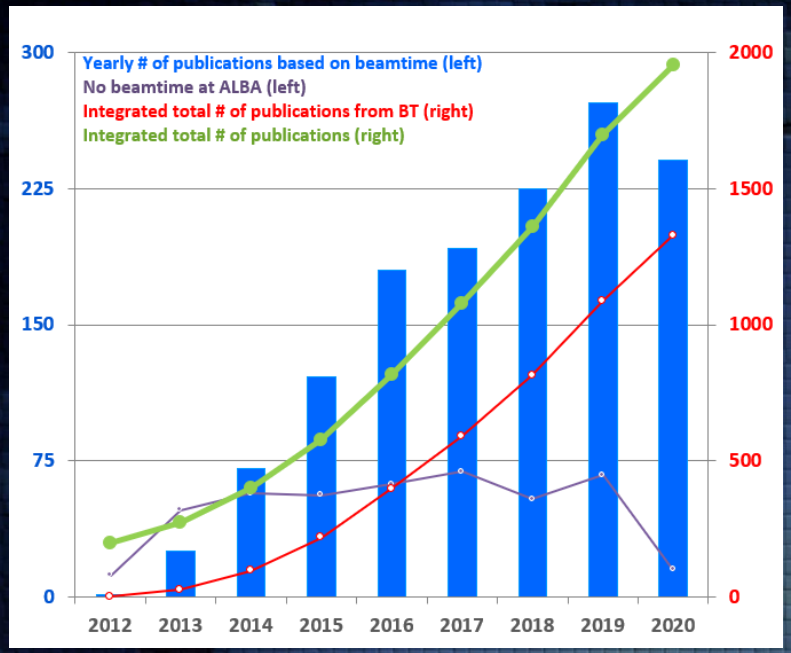
C. Biscari

ALBA today



3 GeV e- synchrotron
270 m circumference
250 mA operating current
> 98% availability

Today

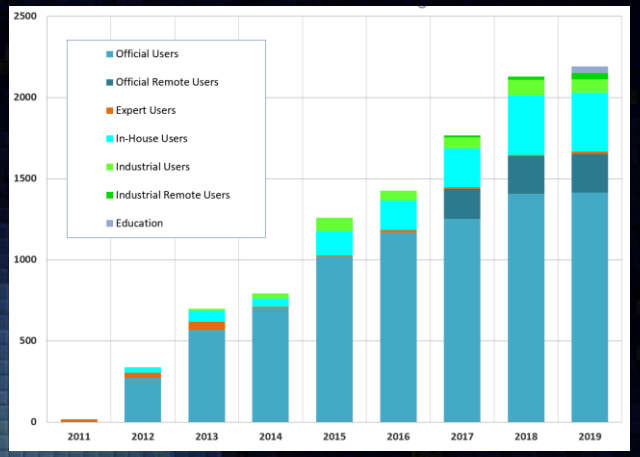


+1950 publications

+300 yearly experiments

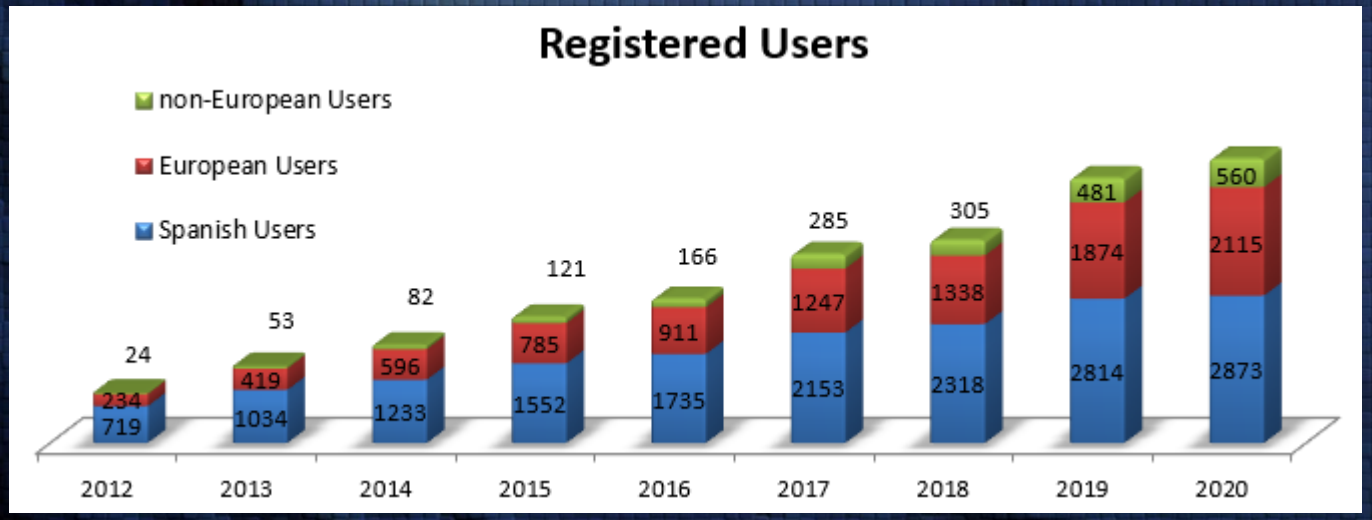
ALBA science and users

+ 2200 user visits/y

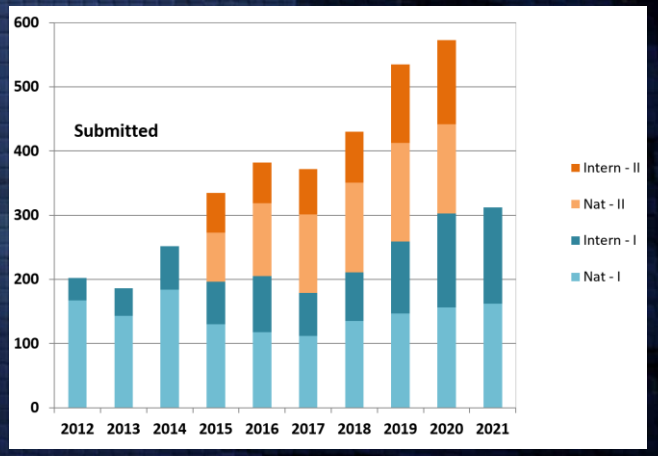


2/3 from Spain

User database:
2873 national
2675 international users

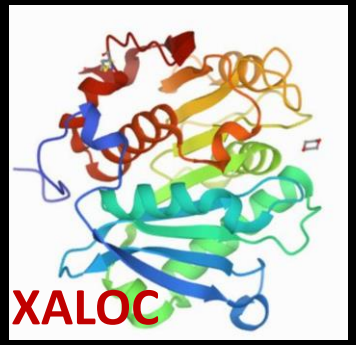


Continuous increase of proposals #



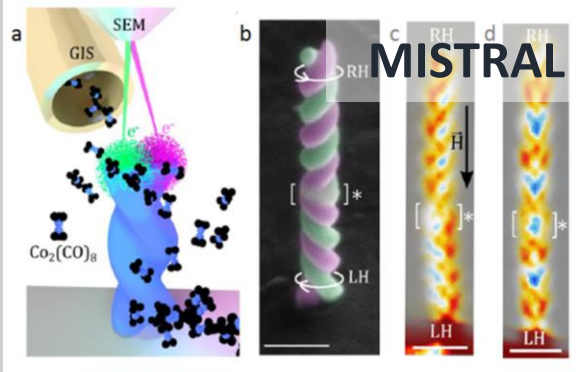
Few highlights from the many scientific results published in the last months

DEVELOPMENT OF A NEW ENZYME FOR THE RECYCLING OF PET PLASTIC WASTE INTO NEW BOTTLES



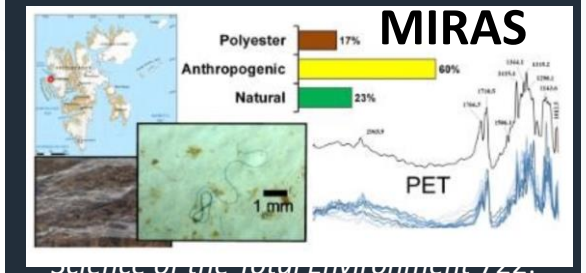
Nature 580,(2020)
doi.org/10.1038/s41586-020-2149-4

ARTIFICIAL DOUBLE-HELIX FOR GEOMETRICAL CONTROL OF MAGNETIC CHIRALITY



ACS Nano 2020. DOI: 10.1021/acsnano.0c00720

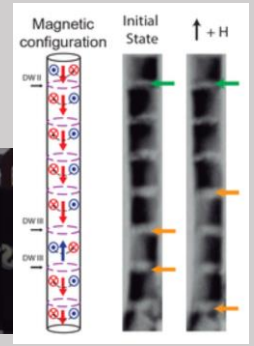
MICROPLASTICS DETECTED FOR THE FIRST TIME IN A FRESHWATER LAKE IN THE ARCTIC



137904.
https://doi.org/10.1016/j.scitotenv.2020.137904

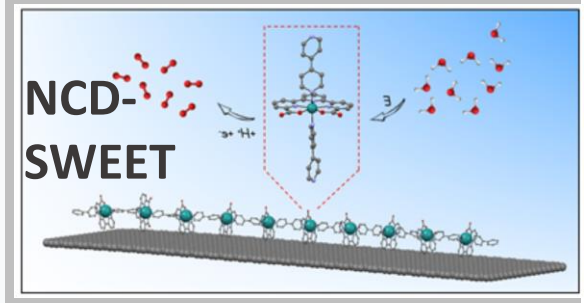
NANO-BARBER POLES": HELICAL SURFACE MAGNETIZATION IN NANOWIRES

CIRCE & MISTRAL



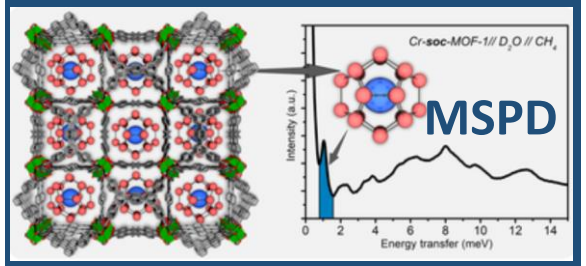
Nanoscale, 2020.
DOI: 10.1039/D0NR05424K.

OLIGOMERIC MATERIALS TO ENHANCE WATER SPLITTING



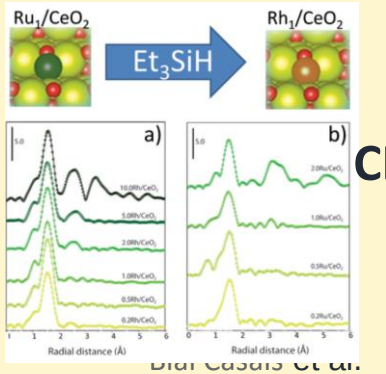
Nat. Chem. **2020** (DOI: 10.1038/s41557-020-0548-7)

NANOTECHNOLOGY-BASED SYSTEM THAT CAN TRANSPORT METHANE AT LOWER PRESSURE AND COST



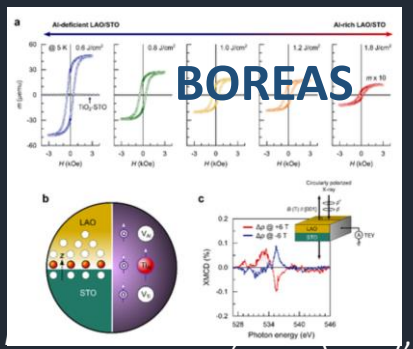
. *Am. Chem. Soc,* 2020,
DOI: https://doi.org/10.1021/jacs.0c0145910.1103/PhysRevLett.124.087206

OPTIMIZING THE PRODUCTION OF ORGANOSILANES WITH SINGLE-ATOM CATALYSIS



Angew. Chem. Int. Ed. (2020).
DOI: **10.1002/anie.201915255**

UNEXPECTED PHYSICS IN COMPLEX OXIDE INTERFACES: MAGNETIC ORDERING TUNED BY DEFECTS



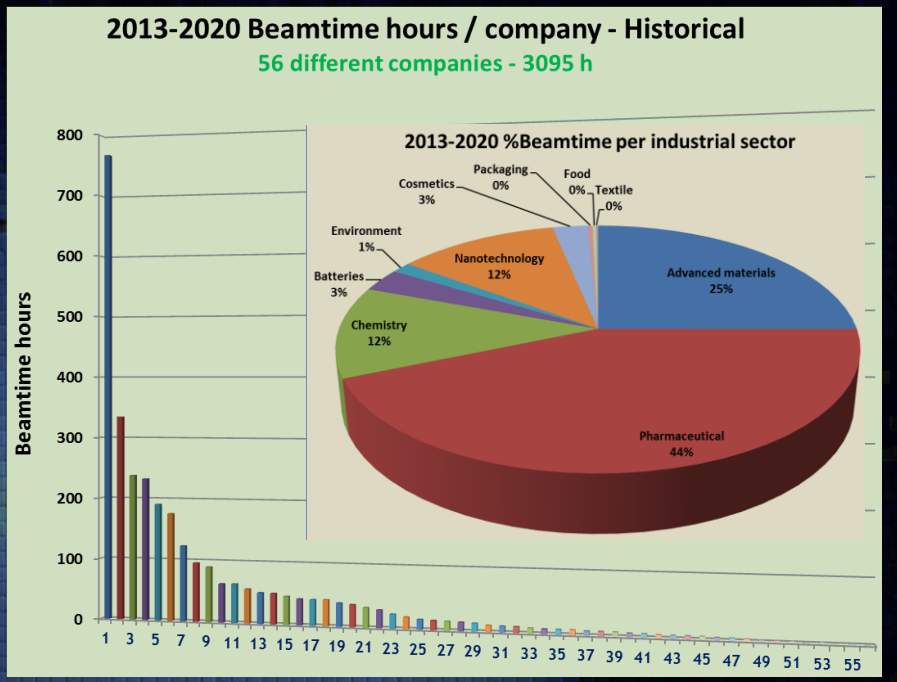
https://doi.org/10.1038/s41467-020-17377-0

Today

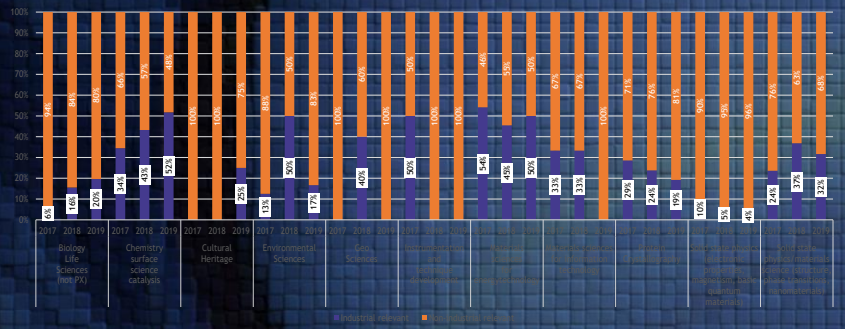
Technological transfer

Industrial beamtime in all BLs

Dedicated staff



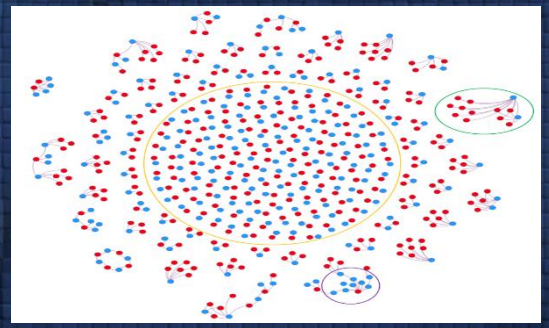
Industrial relevance of academic experiments



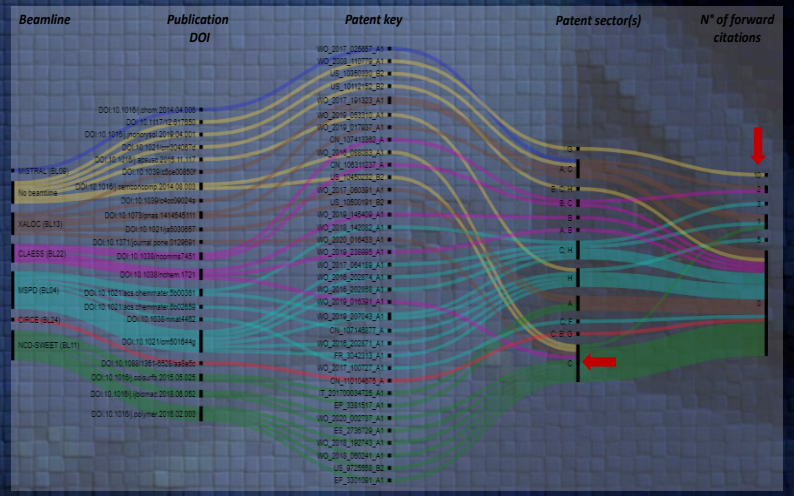
ALBA innovation

Industrial participation in BL funding (Henkel @ FaxTor)

Patents citing publications



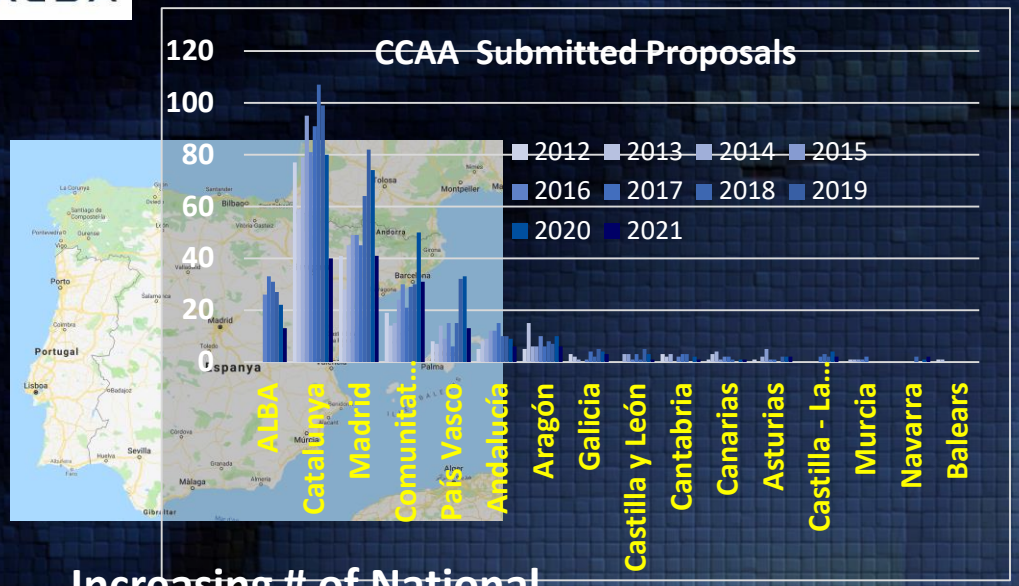
243 ALBA P1 publications (blue dots)
out of a total of 9974 are directly cited by 337 patents (red dots)



15 patents + 337 citing ALBA

ALBA collaborations

Today

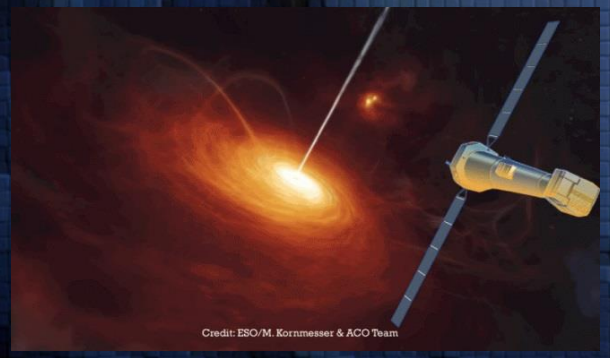


Increasing # of National collaboration projects

Chairing LEAPS on 2020 and 2021

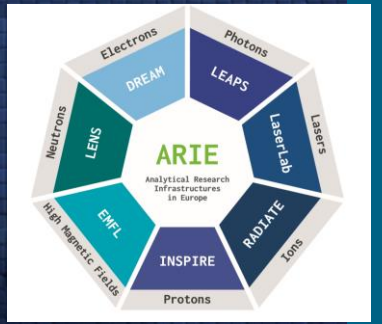
ARIE spokesperson for start-up the collaboration

Minerva: BL in collaboration with ESA



European Commission

Agreement with Portugal



Today

+170 students trained

+7500 outreach visits per year

220 staff

Outreach projects for children

ALBA & society

High-qualified job offers

Positive Economic return of investments

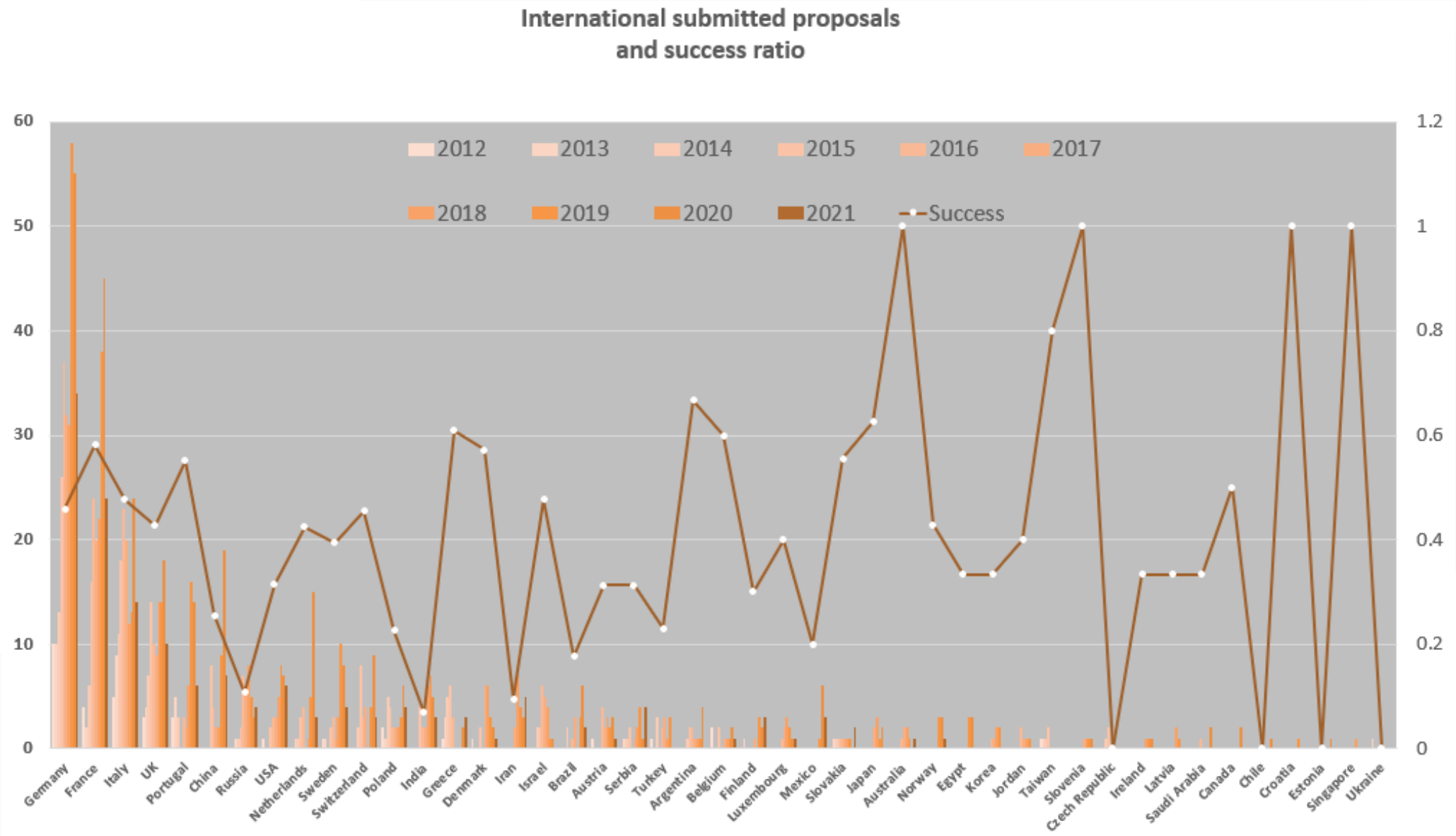
Involvement in educational programs from schools to universities

Organization of scientific and industrial workshops for pharma, chemistry,…

Academic and Industrial PhDs

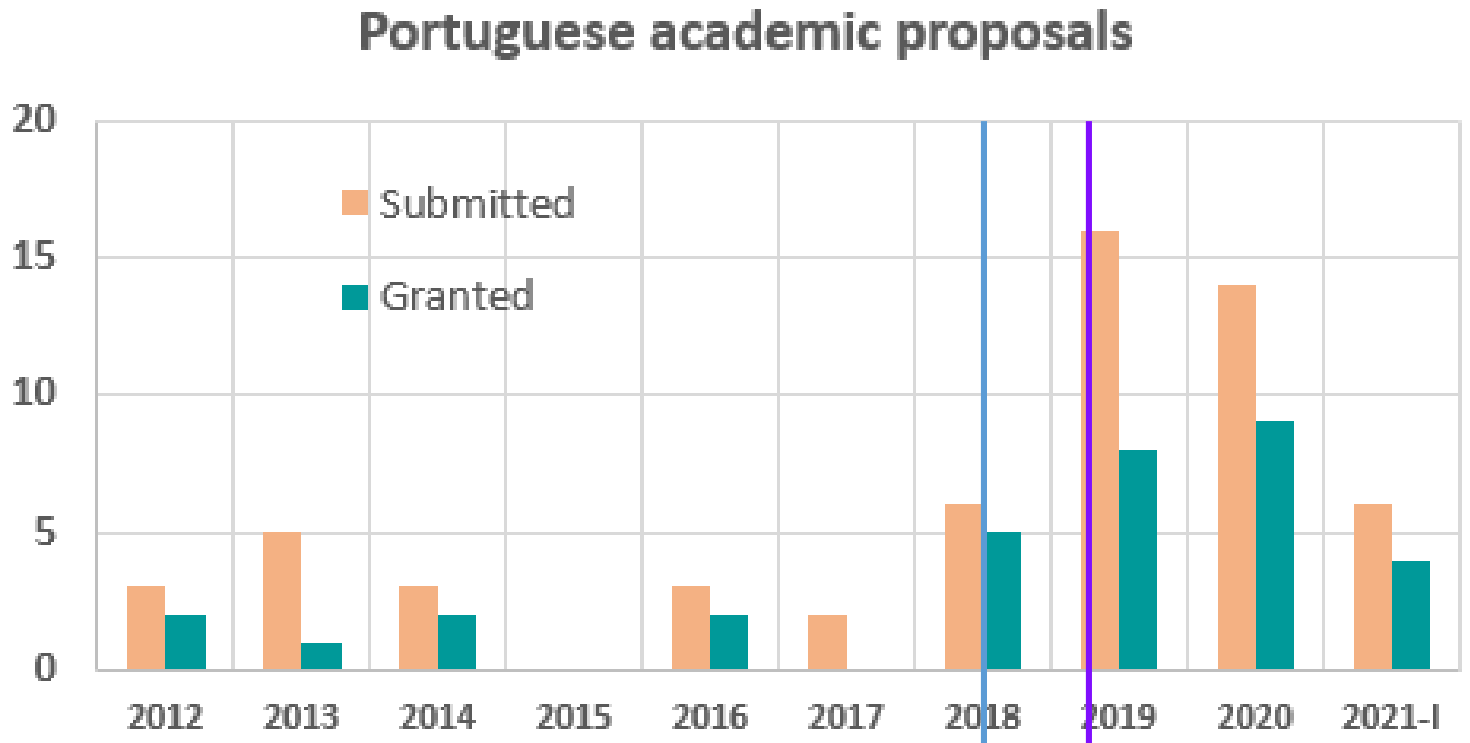
Contributing to health, clean energy, advanced technologies, climate change, environment, food, agriculture, transport & mobility, security, cultural heritage,…

International statistics



Proposals submitted from 45 countries, granted to 41

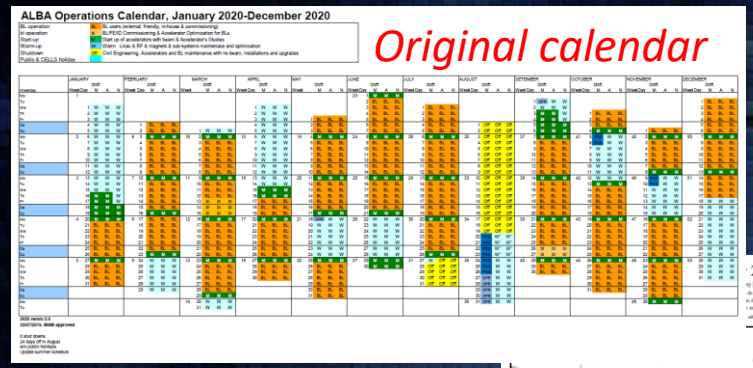
History of Portuguese participation to ALBA calls



Iberian treatment applied in 2018 to Portuguese users

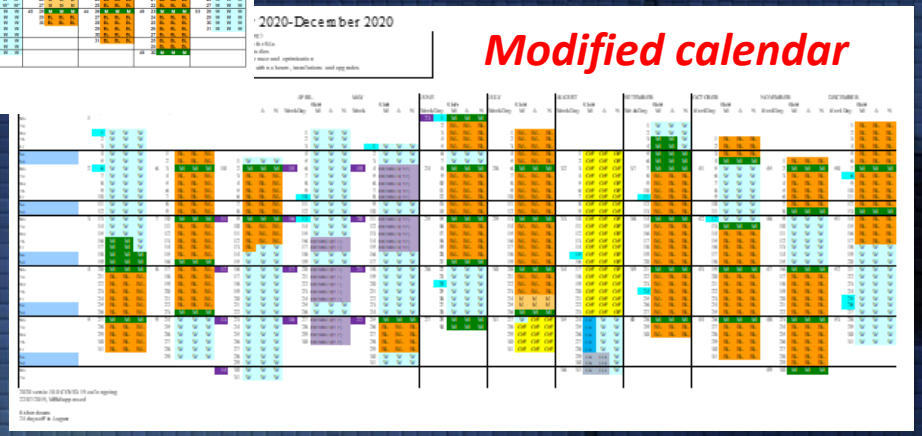
Agreement signed between FCT and ALBA in Feb 2019

Some figure of ALBA during 2020



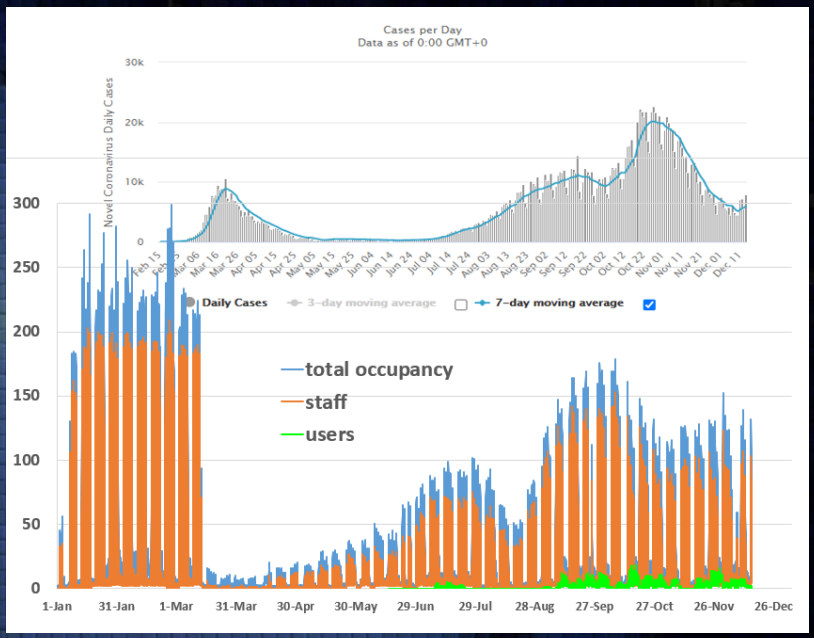
Original calendar

-20% of beamtime

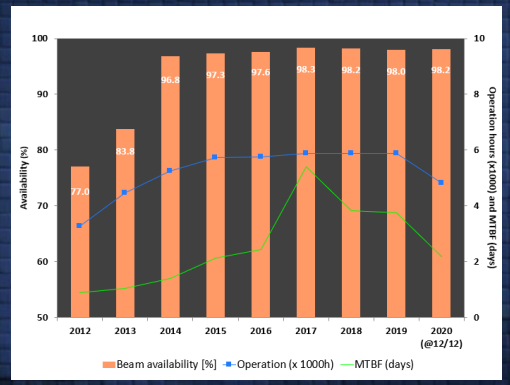


Modified calendar

Combining teleworking and presence at the facility



Availability + 98%



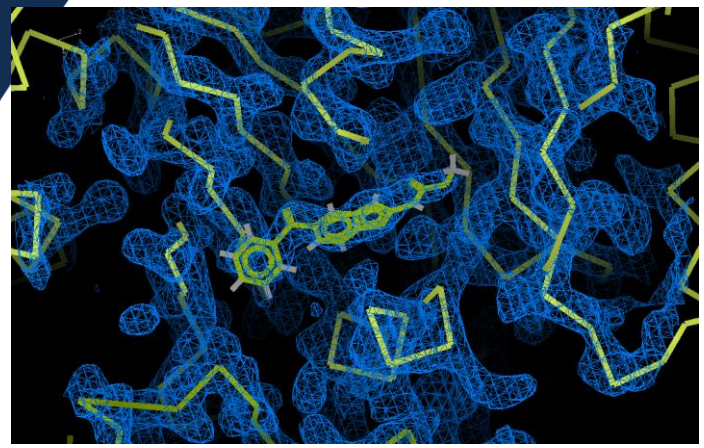
ACADEMIC USERS
Originally scheduled proposals: 263
Performed proposals: 251 (95%) + 7 COVID-10 ones

First photons in 9th BL in July 2020
+ construction of 10 to 13 BLs on going

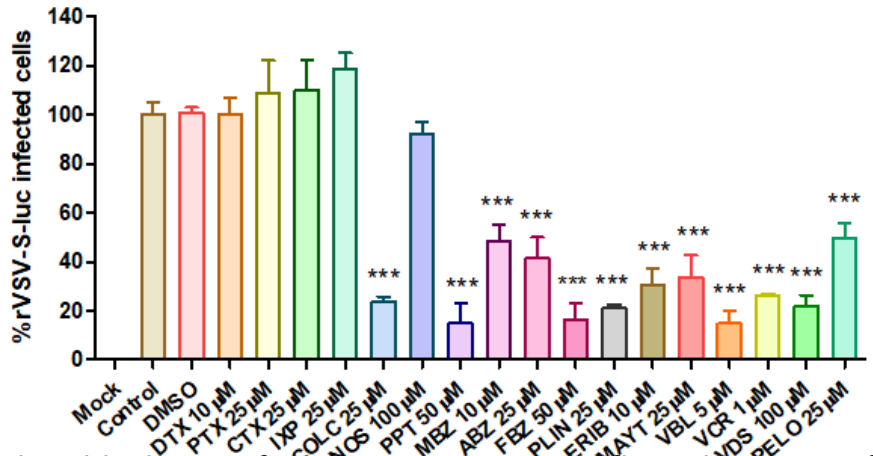
STAFF
Positive tested: 1 (October)
Suspected positive: 17 (Spring)
No evidence of any contagion inside the facility
No user has been infected or has infected

COVID-19 related research

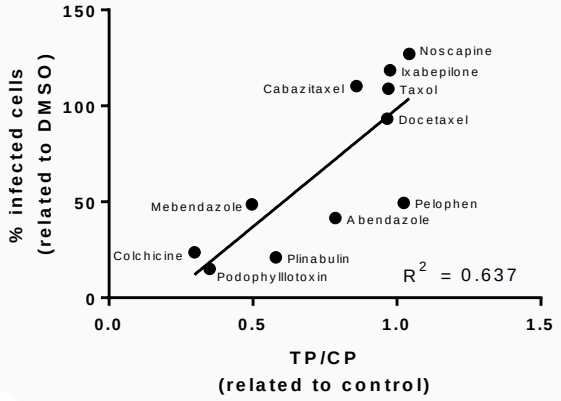
Inhibition of viral replication using microtubule modulators.



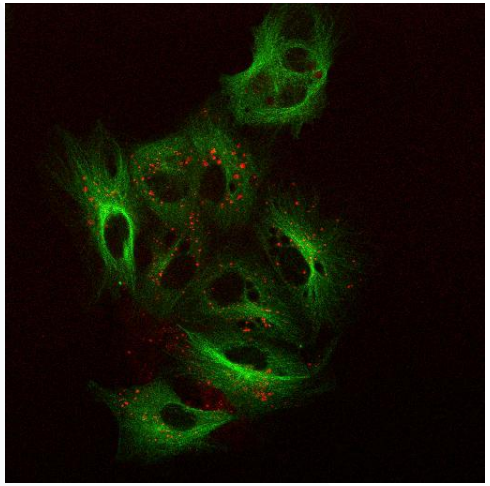
Mebendazole (a in clinical use antiparasite) blocks the activation conformational switch of tubulin precluding the use of microtubules for viral infection (Data adquired at XALOC)



This blockage of the activation is reflected in an effective inhibition of viral replication by compounds using this mechanism of action (Data obtained at INIA)



Viral replication inhibition correlates with the inhibition of movement over microtubules (Data obtained at CIB)



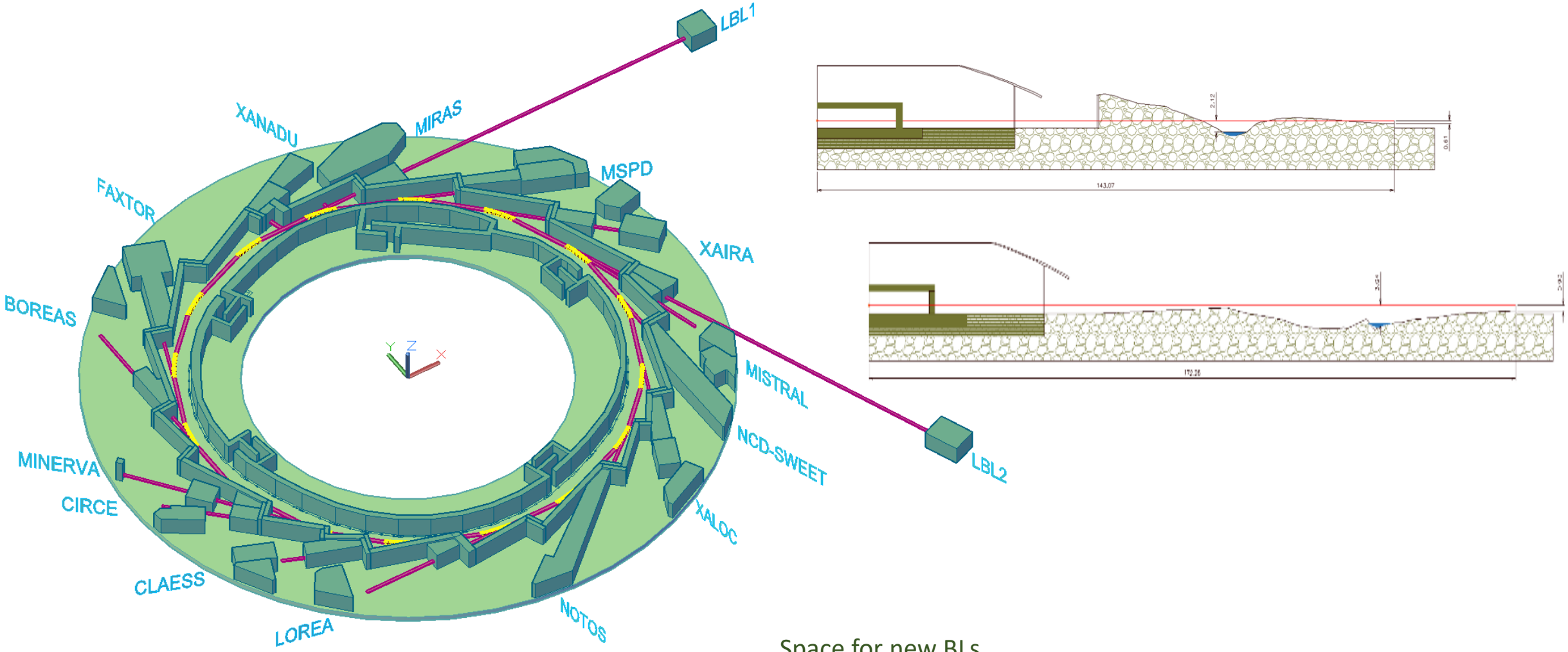
The inhibition of the viral replication is caused by the blockage of the movement of viral particles over the infected cell microtubules. Microtubules labelled in green, viral particles over dynein in red (Data obtained at CIB).

Eight different experiments in 2020 –
1 from PT, 1 pharma – all on quick access
+ six in the 2021-I call

CIB Margarita Salas, INIA, ALBA.

Plans for the future: ALBA II - Building on existing infrastructures

ALBA can leap from 3rd to 4th generation before fully completing the BL portfolio and profit from the space for optimization



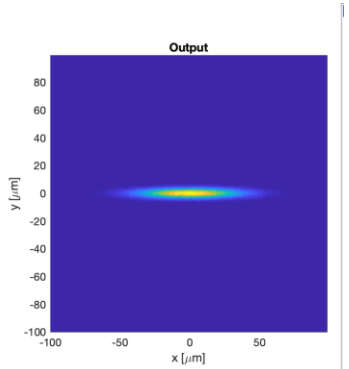
Accelerator new systems

Space for long BLs (nanobeam needs long transfer lines)

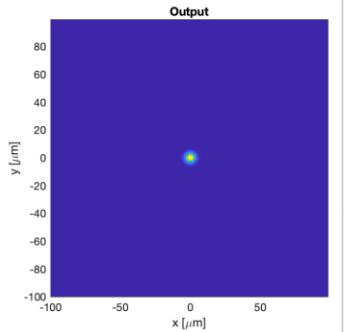
Space for new BLs

ALBA-ALBA II photon beam comparison

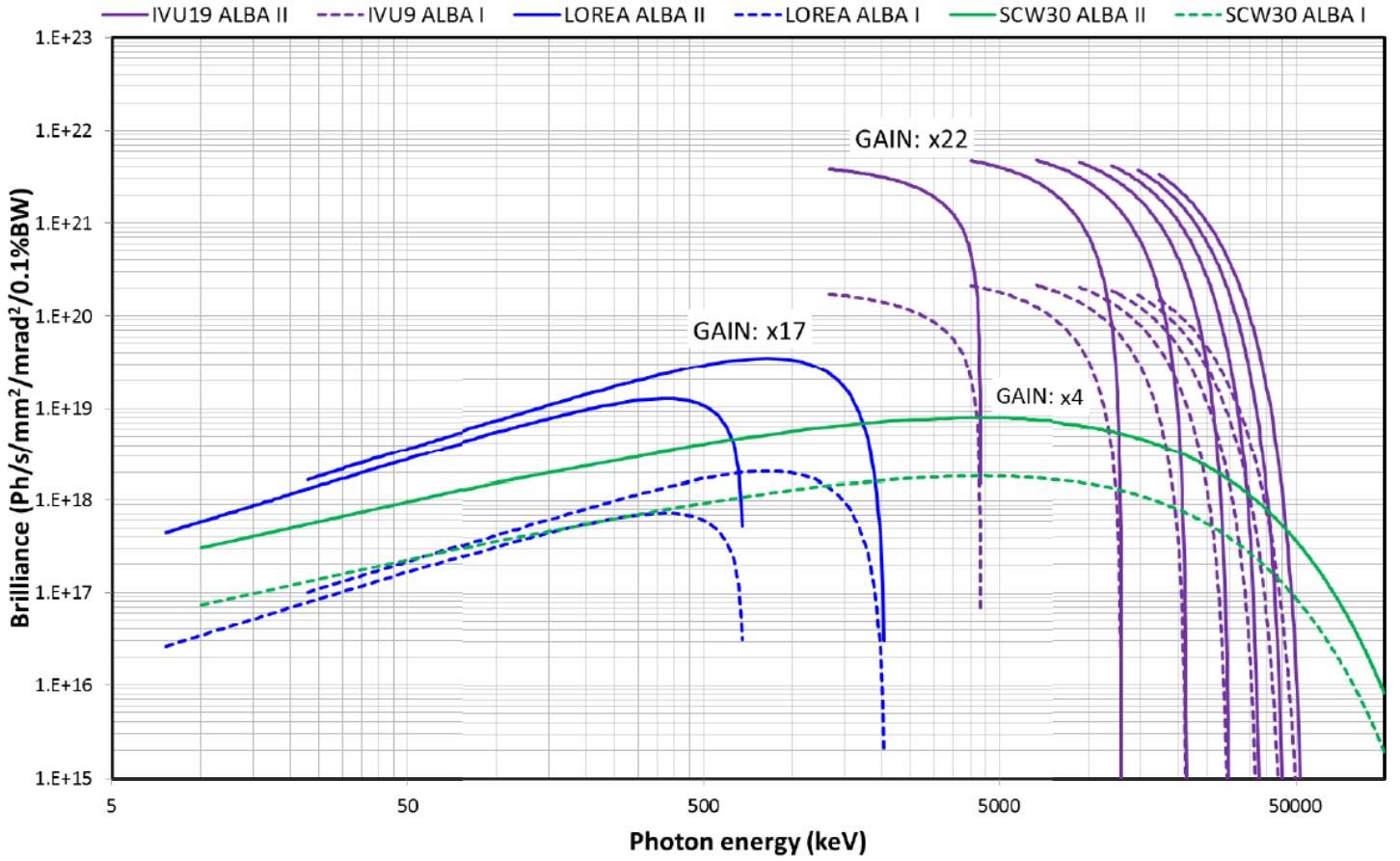
ALBA



ALBA II



Photon beam at the sample position at XALOC Beamline with ALBA and ALBA II (simulations)



Brilliance of Insertion Devices at ALBA (dashed lines) and at ALBA II (solid lines)

Preliminary timeline

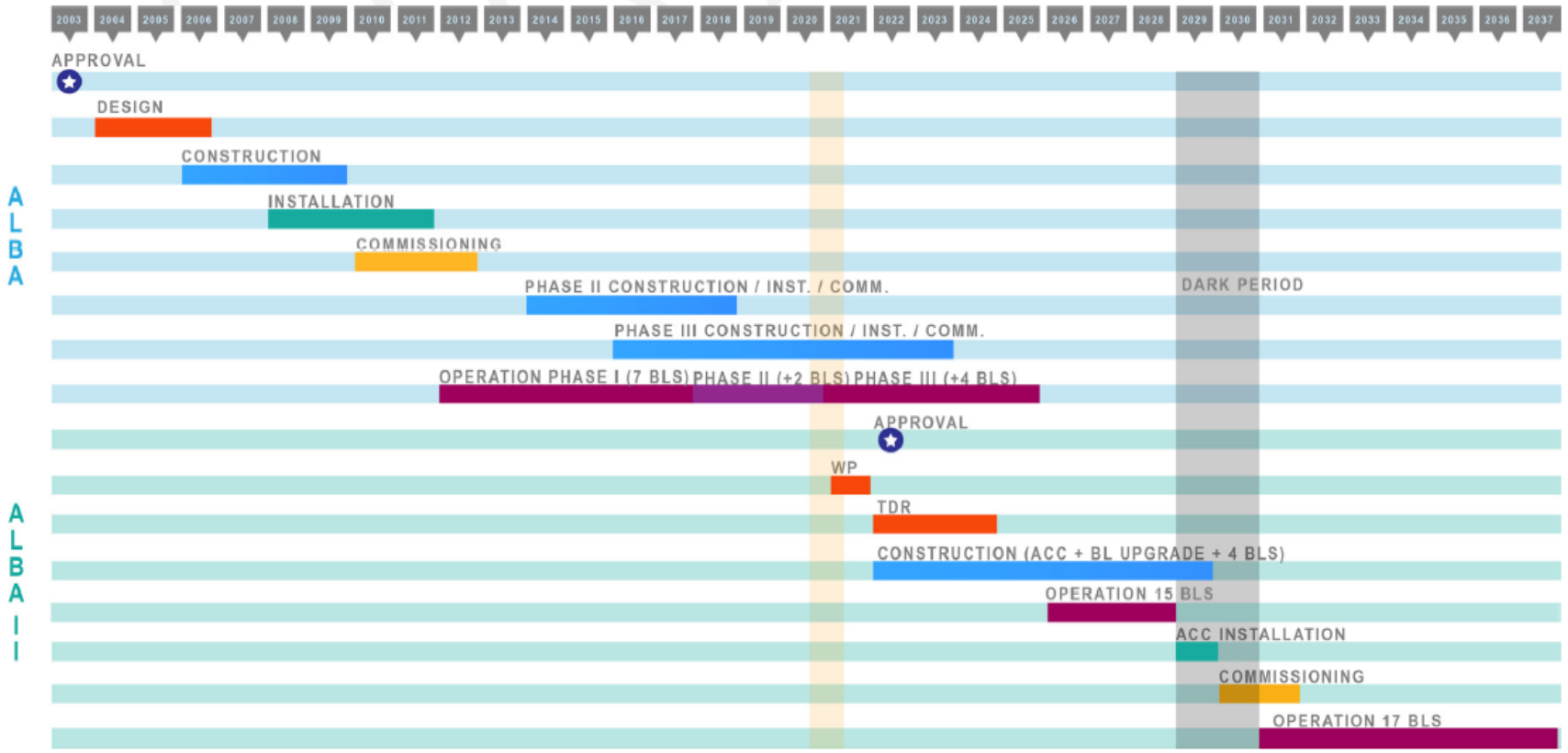


Figure 6– ALBA II timeline. The dark time corresponds to the period with no operation, used for installation and commissioning.

ASTIP (Alba Science-Technology-Innovation Park)
Evolution of Parc de l'ALBA

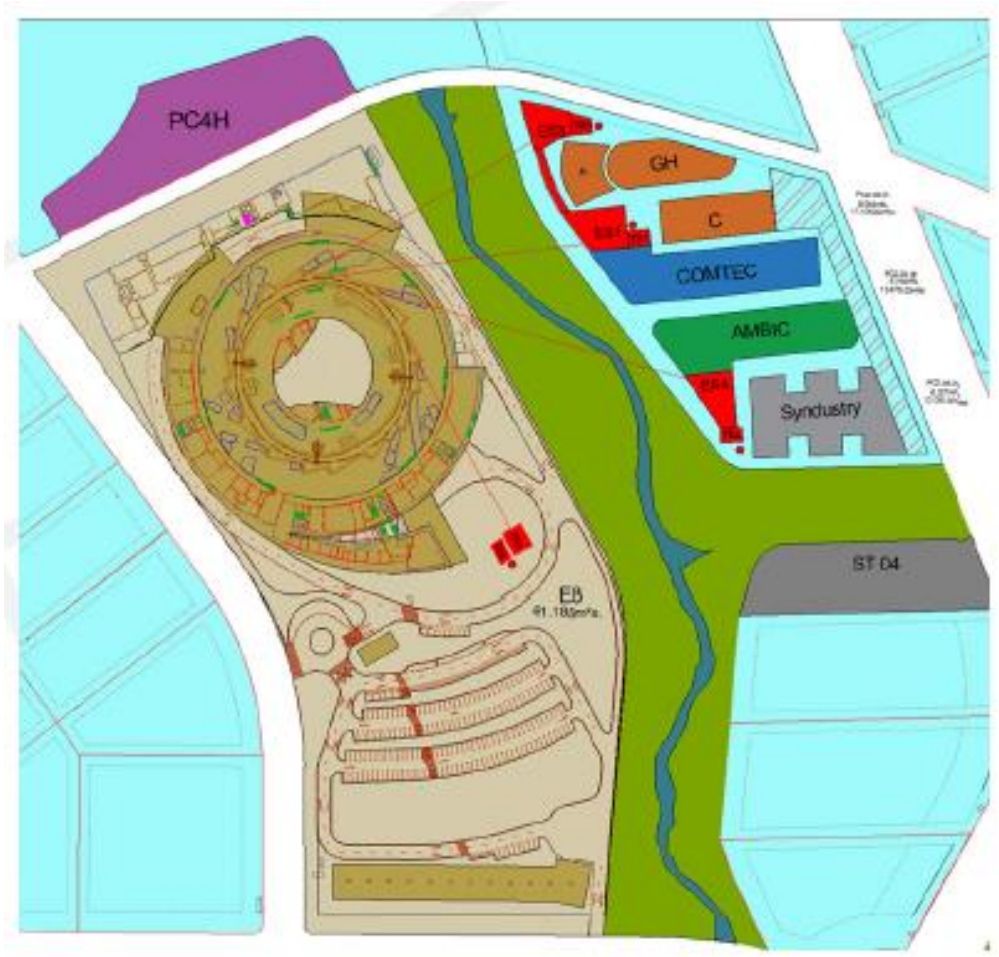
Proposal of developing ALBA surroundings in collaboration with other scientific and technological institutions (i.e. IFAE, ICN2, ICMAB, UAB, CSIC). Plan supported by Ayuntamiento de Cerdanyola del Valles

Synergies:

- Quantum Technology (IFAE, ICN2)
- Data Center (PIC @ IFAE)
- Nanotechnology (ICN2)
- Energy materials
- Detectors (IFAE)
- Shared Advanced Microscope Platform @ ALBA
- Structural Biology center (IBMB)

Guest house serving a wide scientific community

Auditorium for large events



ALBA Rector Council, in its 40th session, held on 16 December 2020, has approved the launching of the ALBA II project design

Thank you for your attention

Thank you for your participation

Looking forward to strengthening our collaboration